REMARKS

Applicants have carefully studied the Office Action of November 17, 2006 and offer the following remarks in response thereto.

Claim Rejections Under 35 U.S.C. §§102 and 103

Claims 1-2 presently stand rejected under 35 U.S.C. §102(b) as allegedly anticipated by Johnson (U.S. Patent No. 5,739,639). Claim 6 presently stands rejected under 35 U.S.C. §102(b) as allegedly anticipated by Haavisto et al. (U.S. Patent No. 6,320,330). Claims 31-35 presently stand rejected under 35 U.S.C. §102(b) as allegedly anticipated by Lebens et al. (U.S. Patent No. 6,305,818). Claims 1-40 presently stand rejected under 35 U.S.C. §103(a) as allegedly unpatentable by Shirai (U.S. Patent No. 5,598,068) in combination with Kawakami (U.S. Patent No. 4,618,812) and Lebens et al. Without acquiescence in the grounds of the rejection, or prejudice to pursue the original claimed subject matter at a later time by continuation application or otherwise, Applicants herein have amended claim 26 to clarify the subject matter being claimed. The rejections are respectfully traversed.

1. The Independent Claims

Each of independent claims 1, 6, 10, and 31 include features that sharply distinguish it from the cited references.

2. Claim 1, as amended, pertains to battery operated LED lighting apparatus comprising, among other things, a "power supply including a boost regulating

circuit," a "constant voltage" being "continuously supplied" to at least one LED, wherein the power supply "maintains the constant voltage by monitoring voltage across the at least one LED." Johnson discloses a circuit for an LED "exit" sign which provides a boost circuit such that an array of LED lamps can operate from a single battery cell. In contrast to claim 1, Johnson does not utilize feedback in general, and, specifically, fails to disclose or suggest "monitoring voltage across the at least one LED" as set forth in claim 1. Consequently, the LED voltage will change as Johnson's battery discharges and, in turn, the brightness of the LED array will reduce as the battery discharges. The portion of Johnson cited in the Office Action (col. 5, lines 63-68) does not appear to mention "constant voltage" and the circuit's effect on the voltage level is at best vague. Thus, Johnson's circuit provides neither a "constant voltage" nor a technique of "monitoring voltage across" an LED as set forth in claim 1.

3. In the Office Action claim 6 is rejected under 35 U.S.C. § 102(b) as being anticipated by Haavisto, et al. (U.S. Patent No. 6,320,330). Haavisto, et al. discloses a circuit for driving an LED to backlight a cell phone display. The circuit of Haavisto, et al. monitors inductor current such that the charge stored in the inductor is constant on a cycle-by-cycle basis. It should be noted that, while the circuit of Haavisto, et al. utilizes inductor current during the interval when charge is stored in the inductor, it does not provide for feedback of LED current.

In contrast, claim 6 includes the limitation that the power supply provides a "constant direct current" continuously to the light emitting diode as the battery discharges. The Office Action does not specify where Haavisto teaches the use of "constant direct current" and, indeed, Fig. 5 thereof makes it clear that the current

across the LED is AC in nature. Thus, the current across the LEDs in Haavisto is neither "constant" nor "direct."

While Haavisto mentions that the LED produces "light energy at a constant level," this is far different than a power supply providing "constant direct current" to an LED.

Haavisto, et al. actually teaches away from constant current:

> In order to produce illumination that appears uniform to the human eye, it is sufficient that the light energy produced during a given period of time (e.g. during 40 ms) is of the same magnitude during such successive periods, particularly when illumination in each period is formed of several light portions of the same size. Hence the illumination may vary within very short periods, but the average illumination power will remain at least approximately constant do that the illumination appears to be non-blinking.

(Col. 12, lines 34-43). This description is consistent with the circuit disclosed by Haavisto, et al. and inconsistent with the constant current limitation of claim 6. In fact, such variations in brightness endorsed by Haavisto, et al. which are inperceivable to the naked eye can artifact or beat with camera shutter speeds and/or frame rates to result in noticeable flicker in the captured image.

Moreover, it is well known in the art that LED forward voltage changes with temperature. Haavisto's circuit will not supply a constant LED current as the LED temperature increases under use, nor as the battery voltage changes.

Lastly, claim 6 has been amended to clarify that the constant direct current is achieved by sensing (feedback) LED current. These teachings are likewise absent from Haavisto.

4. In the Office Action claim 31 stands rejected under 35 U.S.C. § 102(b) as allegedly anticipated by Lebens, et al. (U.S. Patent No. 6,305,818). Lebens, et al. dicloses an LED flashlight which, among other things, maintains output charateristics of the LED over a range of input voltages.

Lebens, et al. discloses a number of embodiments, all of which employ pulse width modulation ("PWM") of the LED current to control one or more characteristics of the light produced by the LED. Inherent in PWM is continous switching of the LED current. In fact Lebens, et al. partially recognizes the problem of PWM in LED lighting used for image capture in that it suggests a solution to this problem by synchronization of the generated light and the shutter of a camera (FIG. 5). While this solution could solve the problem that the number of individual pulses delivered to the LED in successive shutter intervals may vary from frame-to-frame, thereby reducing flicker in the recorded images, synchronization as described by Lebens is impractical in most image capture environments. The requirements of high precision video and movie cameras (e.g. high frame rates, fast shutter speeds, variable shutter angle, shutter ramp control, etc.) make pulse width modulation for LED illumination highly challenging and hence sub-optimal. As shutter speeds increase, it becomes nearly impossible to eliminate beating between the PWM rate and the shutter, at least absent synchronization which would be difficult to manage in a multi-camera, multi-light shot. The invention of claim 31 alleviates this problem since the LED illumination is truly continuous, not pulsed or varying.

Claim 31 therefore includes, among other things, a switch-mode regulator which provides a **continuous voltage output** to the light emitting diodes. Since the output is true direct current, there are no pulses delivered to the LED and no

opportunity for flicker in the recorded images. Thus, Lebens, et al. does not anticipate claim 31.

5-6. In the Office Action claims 1-20 are rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over Shirai (U.S. Patent No. 5,598,068) in combination with Kawakami (U.S. Patent No. 4,618,812) and Lebens, et al. (U.S. Patent No. 6,305,818). Shirai discloses an array of LED lamps consisting of the parallel combination of a plurality of series connected groups, each series connected group having an associated ballasting element. Kawakami discloses a system for selectively engaging step-up operation or step-down operation in a circuit. Kawakami does not disclose any method for providing a DC output (since the inventive aspect of Kawakami is switching between step-up and step-down modes).

Lebens, et al. discloses an LED lighting device which depends on pulse width modulation to control various characteristics of the emitted light. This combination is improper because: 1) the combination is incomplete and fails to describe any of the rejected claims; 2) Lebens, et al. teaches away from the suggested combination; and 3) there is no teaching in any of the three references as to how one of ordinary skill in the art could make the suggested combination.

First, it appears that the Examiner is suggesting that the Kawakami circuit would be substitued for the power supply of Shirai (Fig. 3, ref. 40). However, as noted above, Kawakami is unconcerned with turning the pulse train generated by Q1 or Q2 (Fig. 1) into a DC output and neither shows, nor describes such. Further, Shirai will simply ballast the LED current during the on-phase of the PWM signal of Kawakami but will not produce a continuous output to the LED lamps. Accordingly,

the suggested combination does not provide the continuous output required by all of the rejected claims.

Further, the entire disclosure of Leben, et al. depends on using pulse width modulation both to protect the LED devices from over current and to control various characteristics of the light produced by the LED devices. There is no discussion in either Lebens, et al. or Shiari how these concepts could be combined, or otherwise applied to the Shirai device. There is no indication how one of ordinary skill in the art could apply PWM to the Shirai array or why someone would want to. Even if the suggested combination were made, the PWM requirements of Lebens, et al. is completely inconsistent with the continuous output requirement of all of the currently pending claims.

Finally, and most importantly, all of the rejected claims require continuous output to the LED and Lebens, et al. simply teaches away from this limitation. For example: Lebens, et al. teaches that ballasting of LED current is wasteful (Col. 1, lines 35-42); the invention controls current duration (pulse width) to limit power dissipation in the LEDs (Col. 5, lines 55-57); feedback controls pulse width as a function of various parameters (Col. 7, lines 33-38); etc.

In sum, it is respectfully submitted that the pending claims are neither anticipated nor unpatentable in view of Johnson, Haavisto et al., Lebens et al. Shari and Kawakami and should be allowable thereover.

Reservation of Right to Challenge Cited Items

While Applicants have addressed the cited patent on the merits, this should not be construed as an admission that it constitutes prior art as against the claimed

invention. Applicants reserve the right to antedate the cited patent pursuant to the appropriate rules, laws, and regulations if deemed necessary to do so.

Likewise, Applicants' election to address the cited patent on the merits should not be construed as an admission that it provides an enabling disclosure. Applicants reserve the right to challenge the sufficiency of the cited patent at a later point in time, including in any post-issuance proceeding or suit, if appropriate.

Request for Allowance

The Examiner is kindly requested to enter the amendments presented herein. The undersigned has made a good faith effort to respond to all of the rejections in the case and to place the claims in condition for immediate allowance. Nevertheless, if any unresolved issue remains, the Examiner is invited to contact the undersigned by telephone to discuss those issues so that the Notice of Allowance can be mailed at the earliest possible date.

It is believed that the instant application is in condition for final allowance, and, accordingly, issuance of a Notice of Allowance is earnestly solicited.

Respectfully submitted,

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